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**APPLICATION**

**FOR**

**UNITED STATES LETTERS PATENT**

**TITLE:           TIME SHIFTING ENHANCED TELEVISION  
                  TRIGGERS**

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TIME SHIFTING ENHANCED TELEVISION TRIGGERS

Background

This invention relates generally to enhanced television broadcasts including analog and digital broadcasts.

5 Enhanced television programming enables television programming, in analog or digital form, to be accompanied by additional content. In some embodiments, the additional content may be in the form of Internet-based content. With enhanced television technology, content creators (e.g.,  
10 broadcasters) may transmit hypertext markup language (HTML) data along with the traditional television signals. Viewers may interact with the television broadcast via the Internet.

15 For example, enhanced features may be displayed on a television screen that enable the viewer to access the network's web site for related programming information. The related programming information may be additional advertising or additional details that are not readily incorporated into the television program itself, as  
20 examples. Thus, the user may selectively access additional information through an Internet connection.

A variety of standards exist for enhanced television broadcasts including the Advanced Television Enhancement

Forum's (ATVEF) Enhanced Content Specification, Version 1.1, Revision 26, 1998-1999 (hereinafter referred to as the ATVEF specification). The ATVEF specification provides standards for the transmission and processing of triggers, 5 resources and announcements together with television content to produce a digital or analog enhanced television transmission.

In order to announce the availability of interactive television resources, a trigger may be utilized.

10 Announcements announce programming currently available to the receiver. A resource is a television enhancement or web content displayable in conjunction with a television broadcast as an enhanced or interactive program.

15 According to the ATVEF specification, there are two basic transport types, called transport type A and transport type B. In transport type A, the resource is accessed over the Internet and in transport type B, the resource is transmitted with the television content.

20 Triggers may include a Uniform Resource Locator and may optionally also include a human readable name, an expiration date and a script. Triggers that include a name attribute may be utilized to initiate enhancements either automatically or with user confirmation. The initial top-level page for an enhancement is indicated by a Uniform 25 Resource Locator in the trigger. The script attribute

provides a script fragment to execute within the context of the page containing a trigger receiver object.

The expires attribute provides a expiration time, after which the link is no longer valid. The expires 5 attribute may be in the form [expires: 19971223] according to one example provided in the ATVEF specification.

In some cases, the link to the resource provided by the trigger may be caused to expire after a period of time. This may create problems. For example, in some situations, 10 the enhanced television content may be retransmitted by a local affiliate or so-called franchise network operating center (FNOC). The FNOC may receive the broadcast and then retransmit it at an appropriate time, for example given the FNOC's local time zone. As a result, the expiration time 15 may come and go before the broadcast is ever even transmitted. In such case, a user may be unable to activate the link to obtain the resource.

Similarly, digital recording technology may be available to enable the user to actually record an enhanced 20 broadcast. The user may subsequently attempt to replay the recorded broadcast and may be unable to activate the links to the resource because the links have expired.

Thus, there is a need to enable time shifted enhanced television content to be used effectively in a variety of 25 circumstances.

Brief Description of the Drawings

Figure 1 is a schematic depiction of one embodiment of the present invention;

5 Figure 2 is a flow chart for software in accordance with the embodiment shown in Figure 1;

Figure 3 is a schematic depiction of another embodiment of the present invention;

Figure 4 is a flow chart for software utilized in accordance with the embodiment shown in Figure 3;

10 Figure 5 is a functional block diagram illustrating an embodiment of the invention;

Figure 6 is a flow diagram showing operation of an illustrative type of trigger inserter unit that can be used with the embodiment shown in Figure 5;

15 Figure 7 is a flow diagram showing operation of an illustrative type of stream simulator unit that can be used with the embodiment shown in Figure 5;

20 Figure 8 is a flow diagram showing operation of an illustrative type of proxy that can be used with the embodiment shown in Figure 5; and

Figure 9 is a flow chart for software in accordance with another embodiment of the present invention.

Detailed Description

Referring to Figure 1, an enhanced television delivery system 10 may include a broadcast head end or server 12. The head end or server 12 may provide the television

content such as a television program and the enhanced content or at least a reference to the enhanced content. The enhanced television broadcast is transmitted from the head end 12 to a plurality of receivers 16 (although only 5 the receivers 16a and 16b are shown in Figure 1). The enhanced content may be transported over a transport 14 which may be a cable, a satellite connection or a conventional television broadcast. The enhanced content may be in analog or digital format.

10 Each receiver 16 may include a storage 17 that stores software 18. The receiver 16 may be a processor-based system. As examples, the receiver 16 may be a desktop computer, a laptop computer, a handheld computer, a set-top box or other processor-based appliance with a suitable 15 connection to receive the enhanced content over a transport. The software 18 enables the enhanced content to be time shifted despite the presence of triggers with expiration times.

20 Referring to Figure 2, the software 18 handles the situation where a receiver 16 is utilized to digitally record an enhanced television broadcast. The user may record not only the programming, but also the accompanying triggers. A trigger may be in the form of a Uniform 25 Resource Locator (URL) used to access enhanced content over the Internet or may be a reference to a local storage location of a referenced resource.

Of course, if the trigger has an expiration time, the user may attempt to access the resource via the trigger long after the trigger has expired. In such case, the user may be unable to access the trigger even in the situation 5 where the resource is actually still accessible.

Referring to Figure 2, the software 18 initially obtains the local time as indicated in block 20. The local time may be stored as indicated in block 22. The local time may then be converted into Universal Coordinated Time 10 (UTC), as indicated in block 24, and stored as indicated at 26.

The trigger expiration time may be extracted from the video stream as indicated at 30. The current local time (LocalT) is then subtracted from the trigger expiration 15 time as indicated in block 28. The result is a delta time as indicated at 32. If the delta time is negative, the trigger has already expired and it may simply be discarded as indicated in block 31.

Otherwise, as determined in diamond 34, if the delta 20 time is zero or positive, the expires attribute may be discarded as indicated in block 38. The trigger may then be recorded with the other enhanced television content without a expires attribute. In effect then, a trigger with an expires attribute is converted into a format in 25 which the expires attribute is removed. The absence of an

expires attribute is permissible under the ATVEF specification.

The resulting trigger is then capable of being exercised at any time. If the resource is stored locally 5 (i.e. via a Type B transport), that resource can then be acquired anytime the trigger is selected. If the resource is accessed externally (i.e. via a Type A transport), the resource may not always be active. In such case, the trigger may not be capable of accessing the remote 10 resource.

However, if desired, the remotely accessible resource may be accessed upon acquisition of the trigger and the resource may thereafter be stored locally for subsequent local access. Alternatively, the trigger's Uniform 15 Resource Locator may be modified to a local storage address to access the locally stored resource.

Referring to Figure 5, a system 110, in accordance with one embodiment for recording analog enhanced television broadcasts includes a recording component or 20 "recorder" 112, and a playback component or "player" 114. According to one embodiment of the invention, the recorder 112 stores Transport Type B streams (and can also store Transport Type A streams), while the player 114 can transform and play the stored streams as Transport Type A 25 streams.

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An enhanced television Transport Type B transmission includes a trigger stream 116, an audio/video stream 118, a resource stream 120, and an announcement stream (not shown). The audio/video stream 118 may be a National 5 Television Standards Committee (NTSC) signal. In operation, announcements are sent before or during a television program to a well-known Internet Protocol (IP) address and port number to announce the availability of 10 enhancements. A receiver tunes in to this IP address/port and receives information about how to receive trigger and 15 resource information, where the trigger typically includes a URL that points to a location of the resource.

If resources in the resource stream 120 are extracted by a resource listener 122, such resources are typically 20 stored in a storage media 124, which may be a cache, for example. The storage media 124 may also be a hard disk, floppy disk, digital versatile disk, random access memory (RAM), compact disk, or other suitable machine-readable storage medium. The resource listener 122 may be programmed to reject duplicate or outdated resources, such that only the appropriate resources are stored in the storage media 124.

When the resources are stored in the storage media 124, the trigger(s) corresponding to those stored resources 25 typically include a local identifier URL (e.g., a lid: URL), meaning that the resources were delivered using a

one-way broadcast and are not available on-demand. As such, Transport Type B is used for a true broadcast of both resource data and triggers and can run without an Internet connection. An optional Internet connection can provide a 5 return path if the triggers point (e.g., by using http: or ftp: URLs) to resources that are available on the Internet (e.g., for e-commerce or web browsing).

Transport Type A involves the delivery of triggers along with the audio/visual stream 118. That is, existing 10 Transport Type A transmissions often transmit triggers on the vertical blanking interval (VBI) of the NTSC video signal. Transport Type A transmissions may not transmit a resource stream 120 or an announcement stream. Hence, Transport Type A systems usually use two-way Internet 15 connections to fetch resources using http:.

The system 110 includes a trigger inserter unit 126 for the recorder 112, and a stream simulator unit 128 (which can be likened to a Transport Type A stream simulator) and a proxy unit 130 for the player 114. The 20 end result is that one or more resources 132 may be provided to a receiver unit 16, from the storage media 124, without having to unnecessarily retrieve the resources 132 from the Internet. Furthermore, using the trigger inserter unit 126 to insert triggers into the video signals (e.g. 25 into the VBI) of the audio/video stream 118 provides synchronization between the trigger stream 116 and the

audio/video stream 118 that is not present in conventional Transport Type B systems.

Operation of an embodiment of the trigger inserter unit 126 of the recorder 112 is illustrated in a flow 5 diagram in Figure 6. The trigger inserter unit 126 can be embodied in software, hardware, or a combination of both, and uses data from the trigger stream 116 and data from the audio/video stream 118 as inputs.

At a block 136, the trigger inserter unit 126 first 10 determines if there is a trigger available in the received broadcast. If the received broadcast is a Transport Type A transmission, such triggers, if any, may be in the VBI of the audio/video stream 118 for examples. The triggers are extracted and evaluated for validity as part of the 15 receiving process. If the triggers are valid, the trigger inserter unit 126 stores the data from the audio/video stream 118 (and its associated valid triggers) into the storage media 124 at block 140.

If a Transport Type B transmission is present, then 20 the trigger inserter unit 126 detects the availability of valid triggers from the trigger stream 116 at block 136. At block 138, the trigger inserter unit 126 combines the trigger data with the audio/visual data. More specifically, according to an embodiment of the invention, 25 the trigger inserter unit 126 inserts triggers into the VBI of the audio/visual stream 118. In this manner, the

Transport Type B stream is "transformed" into Transport Type A stream prior to storage into the storage medium 124 at the block 140. Accordingly, by inserting the triggers into the VBI, as the trigger stream 116 and the 5 audio/visual stream 118 are received, the triggers are synchronized in time with the audio/visual data by presenting the triggers along with their corresponding video frames.

At block 140, the trigger inserter unit 126 stores the 10 data into the storage media 124 using a suitable type of audio/video streaming and storage format. Formats such as RealVideo™/RealAudio™, Flash™, QuickTime™, Audio Video Interleaved (AVI), Motion Pictures Experts Group (MPEG), DVD, etc. may be used.

15 The trigger may include URLs pointing to locations of resources. These URLs may be in the form of lid: URLs pointing to the storage media 124 if the corresponding resources were extracted from the resource listener 122 and subsequently stored in the storage media 124. The URLs in 20 the trigger may also be http: URLs if the corresponding resource is available both from the storage medium 124 and from the Internet. Similarly, other URL schemes, such as ftp:, may be used by the triggers to denote the location of resources available from the storage media 124 or from the 25 Internet.

In one embodiment, the resource listener 122 extracts resources from the resource stream 120, regardless of its specific URL, and then stores these resources in the storage media 124. The manner of retrieving stored 5 resources from the storage media 124, rather than from an external Internet source, is described in further detail below with respect to the proxy unit 130.

Figure 7 shows an embodiment of the stream simulator unit 128 that can be used by the player 114. The stream simulator unit 128 may be embodied in software, hardware, or a combination of both. In operation, the stream simulator unit 128 reads, from the storage media 124, the stored audio/video stream 118 and the trigger stream 116 at a block 142. In some embodiments, the stream simulator 10 unit 128 may format the resulting stream at a block 144, in order to make the resulting stream compatible with the format used by the applicable presentation/display 15 application software. For example, if Microsoft Window's DirectShowTM is used as the presentation software, then the stream simulator unit 128, at the block 144, can format the 20 resulting stream into the DirectShowTM architecture using libraries in the Windows environment.

Next, the stream simulator unit 128 provides the simulated Transport Type A stream to the receiver 16. As 25 an example, the receiver 16 may comprise a conventional television set as the display unit 148 and having the

enhanced television module 146 as a separate unit coupled to the television set. The enhanced television module 146 may have the capability to receive enhanced television broadcast data, display/announce the enhanced television 5 features to the user, and then provide the user with interfaces to allow the user to input information (e.g., to interact) with the enhanced broadcast.

Operation of the player 114 using the receiver 16, the stream simulator unit 128, and the proxy unit 130 is shown 10 in Figure 8 in accordance with one embodiment of the invention. The proxy unit 130 may be thought of as an "http: proxy" in that it intervenes in the retrieval of resources 132 having http: URLs. The proxy unit 130 can also be made to intervene and retrieve resources 132 having 15 lid: URLs or other protocol resources, such as a resource having an ftp: URL. That is, the proxy unit 130, in one embodiment, may comprise a thin/simple agent that can reroute a resource request and retrieve the requested resource from a local cache (e.g., from the storage media 20 124) if available, but relinquishes or invokes a normal http: handler to perform the retrieval if the requested resource is not in the local cache (and assuming that an uplink or back channel to the Internet is available).

The proxy unit 130 may be embodied in software, 25 hardware, or a combination of both. In one embodiment, the proxy unit 130 can comprise a set of software communication

instructions or settings in a registry of an operating system of a PC, for example.

In one example, when the receiver 16 receives an enhanced television broadcast, in a simulated Transport

5 Type A stream format having triggers inserted in the VBI, the user can request the resources 132 or the receiver 16 can automatically request the resources 132. If the receiver 16 is Transport Type A-enabled, the requested resources 132 are retrieved externally from the Internet.

10 Therefore, at a block 150 in Figure 8, the receiver 16 sends a URL request for the resource 132 using http: protocols. If the trigger included a lid: URL, rather than an http: URL, then the receiver 16 and/or proxy unit 130 can retrieve the resource 132 directly from the storage

15 media 124, which may be a local cache.

At diamond 152, the proxy unit 130 intercepts the http: request from the receiver unit 134 and determines if the resource 132 is in the storage media 124. If it finds the resource 132 in the storage media 124, then the

20 resource 132 is retrieved from the storage media 124, as indicated at block 154, and is provided to the receiver 16 for display and/or other use by the receiver 16. As indicated at diamond 152, the proxy unit 130 may retrieve resources 132 having lid: URLs from the storage media 124, 25 as well as resources 132 having http: or ftp: URLs from the

storage media 124, if the resources 32 are stored there, or externally from the Internet.

If the proxy unit 130 does not find the requested resource 132 in the storage media 124, then at a block 156, 5 the proxy unit 134 may attempt to retrieve the resource 132 from the network (e.g., from the Internet). If the retrieval is unsuccessful as determined at 158, then a failure message is sent to the receiver 16. In response, the receiver 16 may cause the proxy unit 130 to try again, 10 or the receiver 16 may display a message to the user on the display unit 148 to notify the user of the unavailability of the resource 132 or other appropriate response.

If the resource 132 is successfully retrieved by the proxy unit 130, then the retrieved resource 132 can be 15 stored in the storage media 124, as indicated at block 160, and then subsequently provided to the receiver 16, thereby providing the user with enhanced television content and features.

Embodiments of the invention may transform Transport 20 Type B streams into a simulated Transport Type A stream by inserting triggers into the video stream. The recorder 112 stores resources and the transformed stream in the storage media 124. During playback, the player 114 may read the triggers in the stored simulated Transport Type A stream 25 from the storage media 124 and use the proxy unit 130 to retrieve requested resources from the storage media 124 or

externally from the Internet, if the resource is not already stored. As such, Transport Type B transmissions appear like and are treated like Transport Type A transmissions by the receiver unit 134.

5 Referring next to Figure 3, an embodiment with a regional affiliate or FNOC 82 includes a broadcast head end 12 and transport 14 as described previously. The FNOCs 82a and 82b receive the enhanced television programming over the transport 14 and then provide the programming to local 10 receivers 16. The local receivers 16a and 16b may receive the broadcast over still another transport (not shown).

15 Each FNOC 82 may include a storage 84 that stores software 50. The FNOCs 82 may include a processor-based system that is capable of executing the software 50 stored on the storage 84.

If the FNOC rebroadcasts the enhanced broadcast at a later time than was originally intended, an issue arises with respect to trigger expiration. For example 20 programming originating in one time zone may be provided to a FNOC 82 in another time zone. The FNOC 82 may determine that it is most appropriate to time shift the programming to an appropriate local time zone, time slot for rebroadcast. However, in some cases, the triggers may be expired by the time the material is actually retransmitted.

25 The software 50 accounts for this potential transmission time shifting by the FNOC and adjusts the

expires attribute accordingly. Referring to Figure 4, the software 50 begins by obtaining the FNOC's enhancement start time or the scheduled time for the program to start (StartT) as indicated in block 52. The enhancement start 5 time indicated in block 54, is converted to UTC at 56 and as indicated at 58.

The trigger expire time (TriggerT) is extracted from the enhanced television stream as indicated at 62. The enhancement start time (StartT) is then subtracted from the 10 trigger expire time (TriggerT) as indicated in block 60. This results in a delta time (DeltaT) as indicated at 64.

A check at diamond 66 determines whether the delta time is greater than or equal to zero. If not, the trigger is discarded as indicated in block 68.

15 Otherwise, a retransmission time equal to the retransmission start time plus the delta time is utilized (block 70) as the new expires attribute in the trigger. The retransmission start time or time that the FNOC will rebroadcast the enhanced programming in local time is 20 acquired as indicated at 72, converted to UTC as indicated in block 74 and stored as a retransmission start time as indicated at 76. Thus, the retransmission start time as determined by the FNOC is then added to the delta time at block 70, to create a new trigger expires attribute as 25 indicated at 78. This attribute is saved as indicated at block 80.

As a result, the expiration time may be executed as originally intended at the head end. That is, the expiration time may be extended in accordance with local time to a predetermined amount of time after the initial 5 broadcast. This effectuates the original intent of the expires attribute in the original enhanced television broadcast.

In the case of rebroadcasting data received via a Type B transport, the resource may be locally accessible and the 10 handling of the triggers may be in accordance with the above description. However, in the case where the FNOC receives a Type A transport, simply adjusting the expires attribute without more may result in the situation where the resources may not be accessible because the web site 15 addressed through the trigger may no longer be operable.

This problem may be handled in at least two different ways. Under one approach, the FNOC may automatically access the web site through the trigger's URL and download the content therein. The FNOC may then transmit the 20 resource with the other enhanced content via a Type B transport. Alternatively, the FNOC may translate the trigger's URL to a mirror web site maintained by the FNOC. That is, the FNOC may acquire the content via the URL referenced by the trigger, and copy it over to the FNOC's 25 own web site. The FNOC may then automatically translate the URL in the trigger to a new URL to enable access to the

FNOC controlled web site. In this way, the FNOC can control the availability of the resource while maintaining a type A transport.

Referring to Figure 9, software 170 may be stored and utilized in conjunction with the software 50. Initially, the content is received over the transport as indicated in block 172. A check at diamond 174 determines whether the content is in the type A transport format. If not, the flow ends, and the triggers can be handled readily.

Conversely, if a type A transport is utilized, a check at diamond 176 determines whether a flag is set. In one embodiment of the present invention, the FNOC can set or unset a flag to select whether to convert the type A transport to a type B transport with a locally stored resource or to simply transition the data from the broadcaster's web site to the FNOC's web site. Thus, the FNOC can decide whether to use its own web site or to access the data from the broadcaster's web site and to transmit the data to the receiver 16.

If the flag is not set, the data may be converted to a type B transport, storing the accessed resource locally as indicated in block 180. That is, the FNOC accesses the resource from the broadcaster's web site, and then transmits the resource with the other content to the receiver 16. Conversely, if the flag is set, the FNOC

translates the broadcaster's URL to point to the FNOC's mirror site as indicated in block 178.

In some embodiments of the present invention, time shifted transmissions or playback of enhanced television content may be accommodated despite the use of expires attributes in associated triggers. In this way, the expires attribute may be utilized but the system may not become unduly burdened by the expires attribute.

While the present invention has been described with respect to a limited number of embodiments, those skilled in the art will appreciate numerous modifications and variations therefrom. It is intended that the appended claims cover all such modifications and variations as fall within the true spirit and scope of this present invention.

15           What is claimed is: